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ABSTRACT

Presented are 29 activity cards designed for use with the Elementary Science Study (ESS) program. Each card describes an experiment on one aspect of water flow such as siphoning, methods of removing water from a container, aspirators, floats, and water behavior in various tubing linkups. Activities are intended for individual or small group study; each is illustrated by a photograph or line drawing of the setup. (WB)

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E | elementary
S | science
S | study

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idea cards for water flow

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SE 034 159

G-0

getting water out

There are many ways, besides pouring, to get water out of a container. The G Cards show some of them. They may help you to understand more about what makes water flow.

Try these ideas in the order of the cards, G-1 first, then G-2, and so on.

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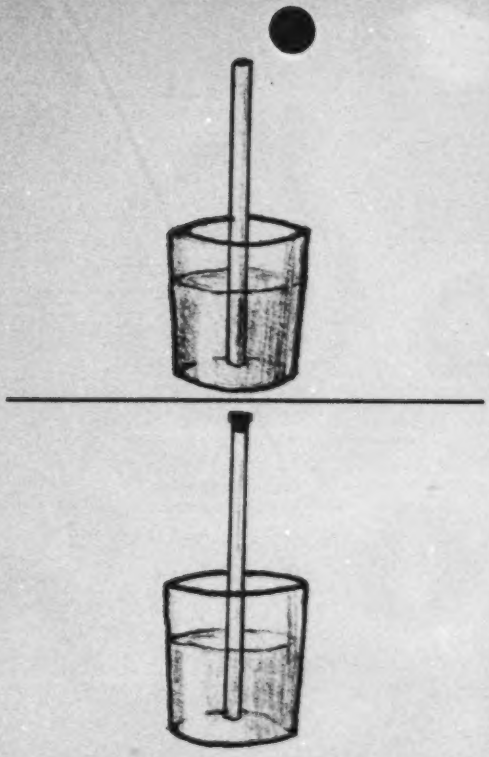

dipping

G-1

1. Can you dip up water from a cup, glass, or bottle with a tube that is open at both ends?
2. Can you use your finger on the tube to dip, or lift, water out of the container?
3. Can you do it with a tube that has a plug in the top?
4. Try some of these things with tubes of different sizes.

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sucking

How does "drinking with a straw" work? Try drinking water from a clean container with two straws.

Now try drinking from the same container with one straw in the water and the other straw outside the cup.

Do you think you will be drinking air? . . . water? . . . both air and water?

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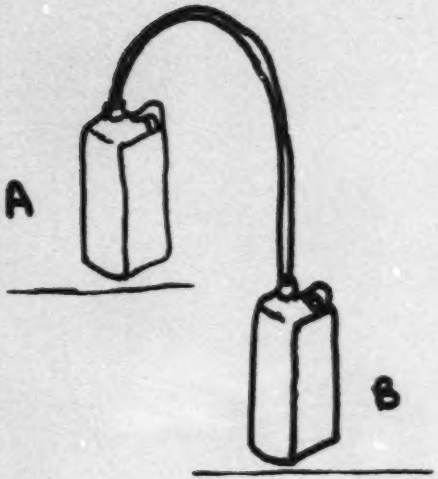

siphons

G-3

Can you get water from bottle A to bottle B with a siphon? (No pouring, no tipping!)

You may need to get the tube filled with water. Can you think of some ways to do that?

Once the tube is filled with water, can you keep the water running from bottle A to bottle B?

Can you siphon water from bottle B to bottle A?

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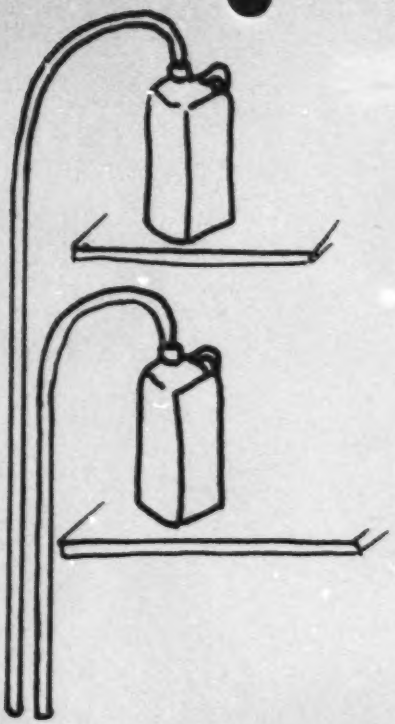

more siphons

G-4

Now try a *siphon race*. Put a full bottle on each of two shelves. The bottom ends of the tubes should be at the same height. Now start both siphons going *at the same time*. Which siphon works faster?

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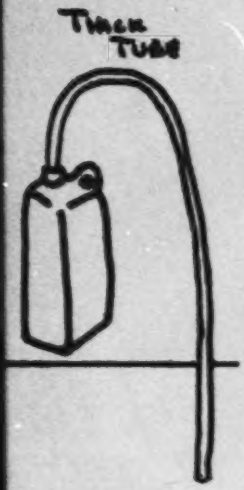
G-5

another siphon race



Run another race. This time put both bottles on the same shelf. Use equal lengths of siphon tubes, one of them a thin tube, the other a thicker tube. Be sure the ends of the tubes hang at the same height, as in the sketch, and start both at once.

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G-6

triple siphon

This boy has three siphons going from the same water supply.

Can you do it?

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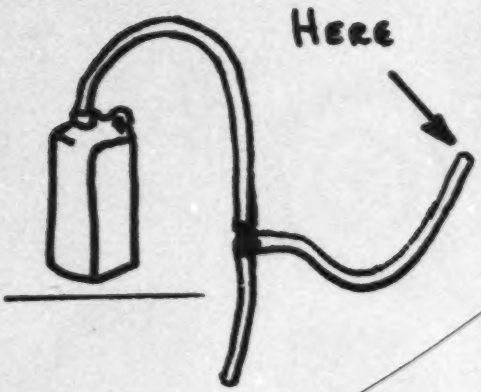
getting a siphon started



A neat way to get a siphon started — without getting a mouthful of water — is with three tubes and a connector:

Can you start the siphon by sucking where the arrow points?

Does it matter where your mouth is? Where the connector is? Where the sink end of the siphon tube is?

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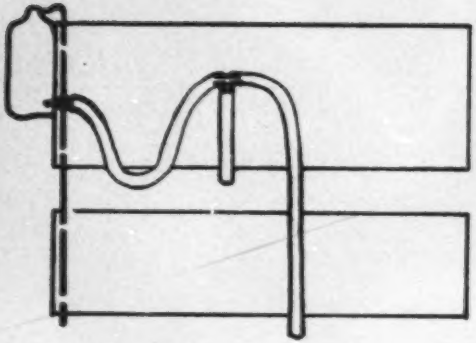
aspirator



First put your finger over the small tube that comes down from the middle of the connector so that the water flows out the long tube.

What happens if you now take your finger away? (Predict first; then try it.)

Now hold a full cup of water so that the short tube dips into the water. Can you get the aspirator to "drink" water from the cup? If you can, you have found another way to empty a container of water without pouring it out!

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another aspirator—the "two-way"

What happens when you pull out the plug (circled in the picture)?

By plugging and unplugging the circled tube with his finger, one boy made the water go down, then up, in the tube at the right. So he called this setup a Two-Way. Can you get a Two-Way to work?

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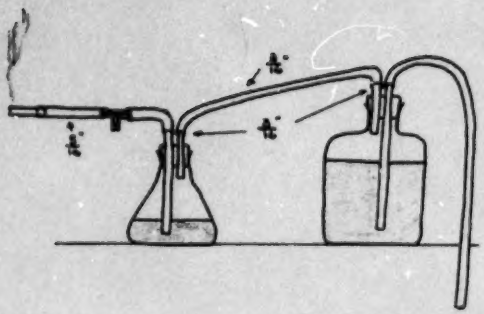
siphon-run smoking machine



Try to make a cigarette smoking machine. Besides the materials in the *Kit*, you will need a glass flask with some water in it, and two 2-hole rubber stoppers to fit the flask and the large water bottle. You will also need cigarettes and matches.

The long tubing at the right acts as a siphon, to let water out of the large water bottle. (You can stop the flow of water by pinching it closed.) If both stoppers are on tightly, when water flows out of the bottle, the air pressure above the water in the bottle is reduced and smoke and new air are "inhaled" through the water in the flask. Notice how quickly the water turns yellowish from the tar and nicotine in the cigarette smoke.

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S-0

standpipes

The S Cards show you some setups that are fun to make and to work with. They also ask you some questions which will help you think about what makes water flow and what keeps it from flowing.

After you have finished each card, you may want to invent your own project. If you want another suggestion, go on to the next S Card. There are nine S Cards on Standpipes. *Your teacher will give you S-4 through S-9 after you have done S-1 through S-3.*

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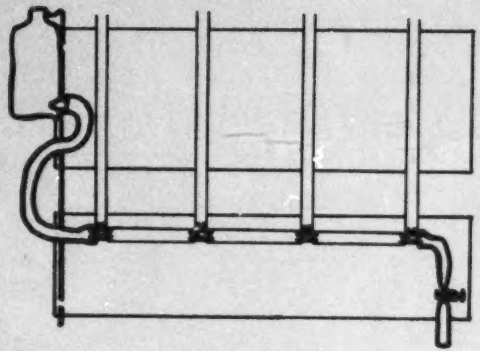
standpipes



In a setup like this one, where do you think the water will go when you fill the bottle? (The clamp keeps the hose at the right side shut off.)

Make a prediction with a chalk mark on the pegboard next to each standpipe, or make your prediction on a worksheet. Then try the experiment. How close was your prediction? (Show on your worksheet what really did happen.)

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changes

Try all kinds of changes in the standpipes setup. Before each change, shut off the clamp. After each change open it up and see what happens.

Here are some things you could do:

Raise or lower the bottle.

Put stoppers on some or all of the standpipes.

Blow on the bottle or one of the standpipes.

Suck on the bottle or one of the standpipes.

Put a hose connection from one standpipe to another.

Invent other changes. Don't go on to S-3 today. Work some more on this setup, and start S-3 next time.

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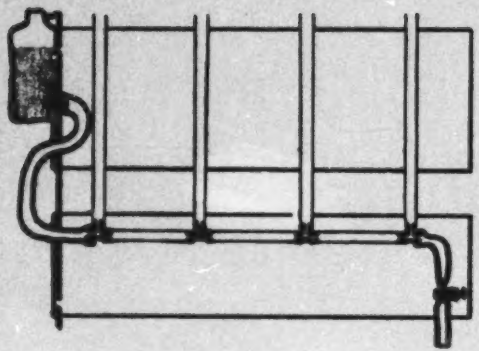
a problem



If the bottle is filled to the mark shown in the sketch, and the outlet hose is clamped shut, how high will the water stand in each standpipe?

Will it be the same in all the standpipes?

Sketch your prediction on a worksheet or with chalk on the pegboard. *Then* try it.

Was your prediction right?

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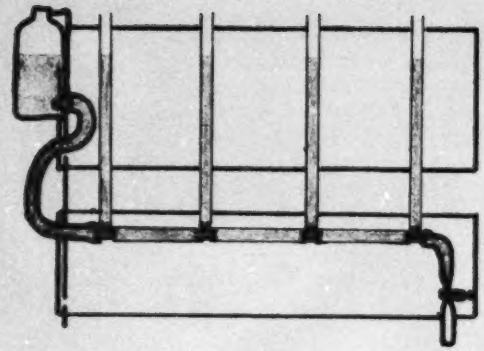
an experiment



Close the clamp on the outlet hose, and put water into the system. Suck on the bottle to get out any air in the tube attached to the bottle, so that it looks like this.

Try to guess what will happen to the water levels when you open the clamp. Make a mark next to each standpipe to show your guess.

Try it. Open the clamp. Watch for a while.

What was the level in each standpipe when the bottle was half-full? Mark *that* next to each standpipe (or on a worksheet).

Were you surprised?

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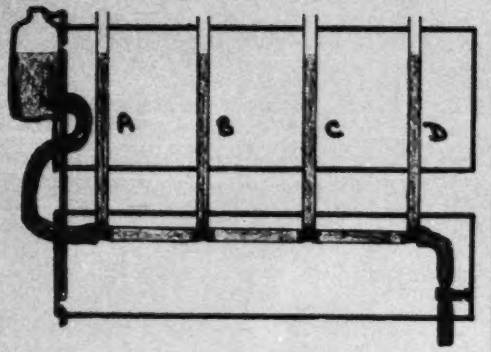
standpipes with color



Make the same setup as in S-4.

Now add a little yellow color to the water in the bottle, and a different color to each of the standpipes A, B, and C.

Predict the water levels and colors after you have opened the clamp and the bottle is half empty. Does any water go up any of the standpipes after you open the clamp?

Predict what will happen if you *close* the clamp when the bottle is about half empty. Try it. Tell what really did happen.

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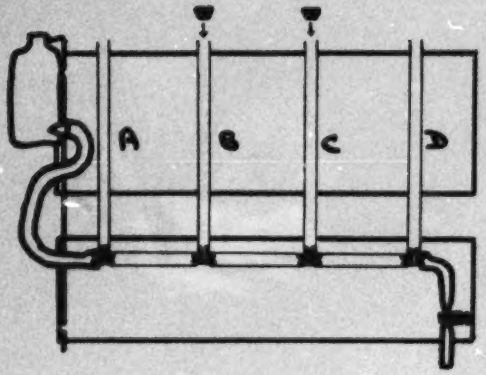
S-6

standpipes with caps



Make the same setup as in S-4.

First suck out the air from the inlet tube and let the water come to the same level in each standpipe.

Now put tight-fitting plugs on two of the standpipes.

Predict what will now happen when you open the clamp.

Try it several times.

Plug different pairs of standpipes.

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a problem

Why is the water level higher in the tube on the right than it is in the tube on the left?

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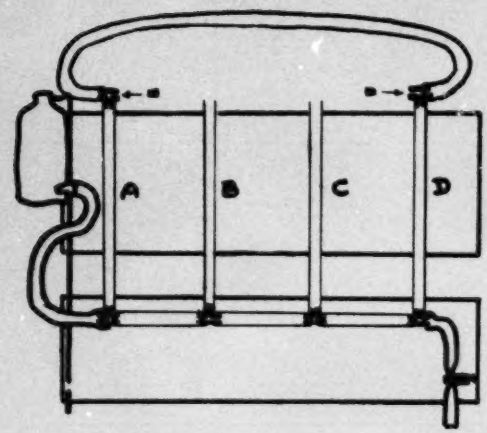
standpipes with connecting tube



Make the same setup as on S-4. Now add a tube from standpipe A to standpipe D. Put water into the bottle, close the outlet with the clamp, and get rid of the air bubbles by sucking on the bottle. When all levels are the same, plug up the extra ends of the T-connectors at the tops of A and D.

What will happen *now* to the water levels when you open the clamp? Mark your guess on the pegboard or on a worksheet, and then try it.

Were you surprised?

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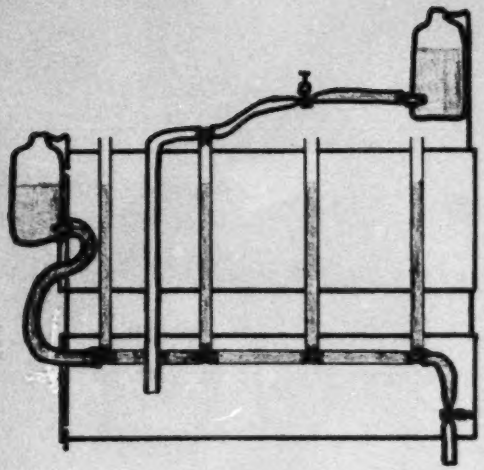
another aspirator



Try this:

Keep the bottom outlet closed. Color the two water supplies differently. Then open the hose clamp on the tube from the upper water supply.

Some students got this system working so that water from the lower bottle came *up* standpipe B and down the drain. Can you do it? You may have to adjust the heights, but do not raise the bottle above the standpipes. *This one is hard!* If you make it work, record the water levels in the open standpipes.

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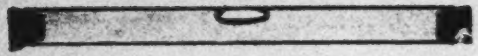
X-1

making a level



Plug a long stiff tube at each end and fill it with colored water, except for a very small air bubble.

Try to make the bubble stay in the middle of the tube (as in the sketch).

Try all three sizes of stiff tubes.

Why do you think this device is called a "level"?

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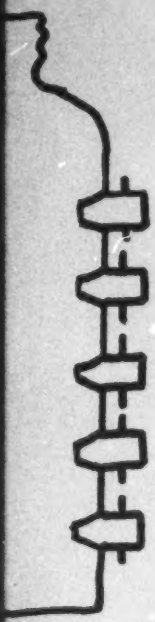
fountain



Bring a plastic bottle to school (cider, juice, bleach, or milk bottle).

Make about five holes with a sharp pencil, and insert a spout (either half of a Quick-Disconnect coupling) in each.

Fill the bottle. (Work at the sink or outdoors for this one!) Which spout gives you the longest stream?

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color floats

X-3

Cut a $\frac{3}{16}$-inch tube in half (making it about 9 inches long), fill it two-thirds full of colored water, and plug both ends.

Put this inside a full-length $\frac{5}{16}$-inch tube about half-full of different-colored water, and plug both ends.

Keep the tubes vertical (up and down) and turn them slowly end over end several times. Watch the places where you get both colored parts in the same place and those where you can see the two colors separately. What new colors can you make?

Try this with different pairs of colors.

NOTE: Do this near a sink or pail.

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X-4

water flow systems with balloons

There are two balloons in the picture, one in each boy's hand. Can you control the flow (or the height) of the water in some system of your own, using balloons?

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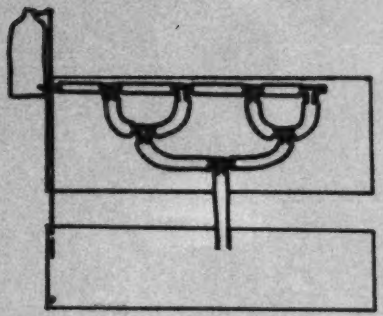

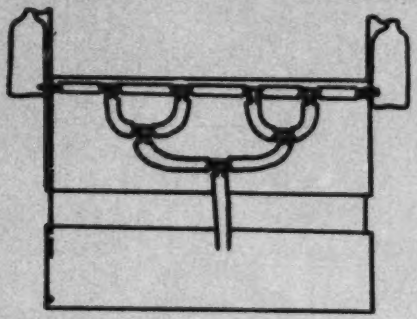

magic loops

X-5

In this system, which path will the water take from the bottle to the outlet?

Now try it with two bottles at the top. To tell water from the two bottles apart, use different colors.

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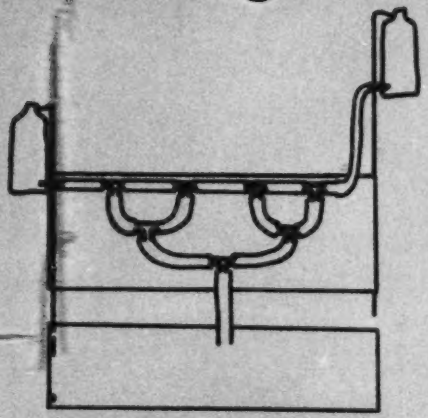

more magic loops

Here one of the bottles is raised up higher than the other. Does this make any difference in what happens?

If you enjoy working with Magic Loops as much as the sixth grader who thought them up, make the same systems with a row of eight T's at the top, then four, then two, and one in the bottom row.

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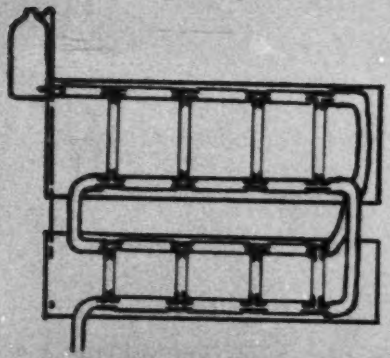

magic squares

X-7

This is a system of almost all stiff tubes. You can use soda straws, but it is hard to keep them all tight on the connectors.

You can vary the system by using different ways to hitch the top row of squares to the bottom row of squares.

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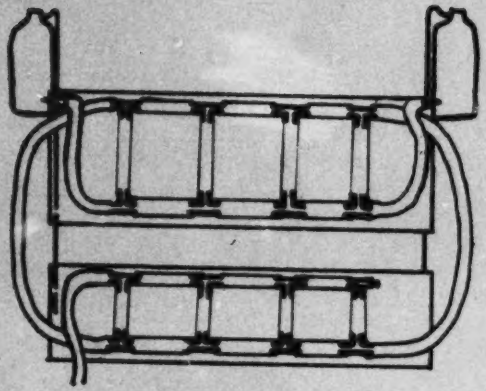
more magic squares



Now try Magic Squares with two bottles of different colors of water.

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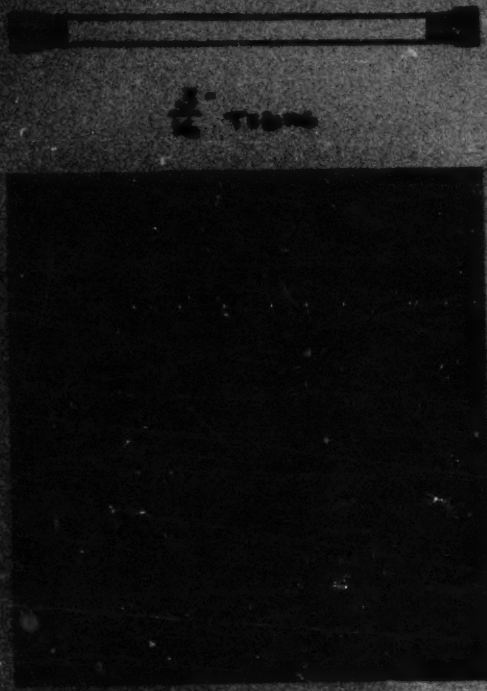
making a float



Cut a short piece of $\frac{5}{16}$-inch stiff tube (the thinnest stiff tube in the kit). Put a plug tightly in each end. (If you wish, you may put water into the float, or something heavier, or nothing at all.)

Put floats in systems built from $\frac{5}{16}$-inch stiff tubes (the thickest tubes in the kit) to change the way water flows through them.

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